COMPUTERISED CORPORATE PLANNING MODEL FOR AN INDIAN COMMERCIAL BANK

By

SHISHIR KUMAR CHATURVEDI

COMPUTERISED CORPORATE PLANNING MODEL FOR AN INDIAN COMMERCIAL BANK

A Thesis Submitted
in Partial Fulfilment of the Requirements
for the Degree of

MASTER OF TECHNOLOGY

By

SHISHIR KUMAR CHATURVEDI

to the

INDUSTRIAL & MANAGEMENT ENGINEERING PROGRAMME
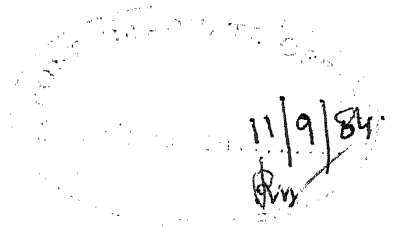
INDIAN INSTITUTE OF TECHNOLOGY KANPUR

AUGUST, 1984

MEP- 1984-M - CHA-COMP

' DEDICATED TO

STRIVATION'

CERTIFICATE

11/9/84

This is to certify that the thesis entitled 'A COMPUTERISED CORPORATE PLANNING MODEL FOR AN INDIAN COMMERCIAL BANK' by Shishir Kumar Chaturvedi is a record of work carried out under my supervision and has not been submitted elsewhere for a degree.

(Dr. Arun P. Sinha)
Assistant Professor
Dept. of Industrial and Management Engg.
Indian Institute of Technology,
Kanpur.

Date:

ACKNOWLEDGEMENT

CONTENTS

ABSTRACT

This thesis designs a computerised corporate planning model for State Bank of India. In this model, logical relationships linking banking activities to the national economy and some other equations and identities were fed. These relationships predict the banking behaviour with respect to economy and some other policy variables. This can help management to test alternative policies and in this respect the model serves as an important aid to the top management in decision making. The effect of environment and of policy variables has been studied in alternative scenarios generated with the help of the model.

CHAPTER -1

INTRODUCTION
Corporate Planning and Corporate Planning Model

1. Corporate Planning

Corporate planning is an integrated approach to decision making. Under it the future implications of every decision are evaluated in advance of implementation. Standards of performance are set up beyond the time horizon of the annual budget. The organisation clearly defines what it's trying to achieve. A continuous study is made of the environment in which the organisation operates so that the changing patterns are seen in advance and incorporated into the organation decision process.

The basic aim of corporate planning is to improve results over time, so that they are better than otherwise would have been achieved. It seeks to do this by encouraging better strategic decisions and more effective implementation of those decisions, and this is achieved because planning aims to fulfil a number of specific needs.

2. Aims of Corporate Planning-

(i) Relation with the environment-

Modern business is affected by changes in the business environment to an ever increasing degree, and

one of the aims of corporate planning is to ensure that this is taken into account during the formulation of strategy. The the business and its environment and their interaction with each other is continually monitored through a good planning process. It is undoubtedly true that business has always been related to the environment in which it operates. Modern corporate planning serves the traditional purpose of keeping organisation aware of its environment and enabling it to be flexible to outside changes. Policy options, alternative strategies and general increased responsiveness are major purposes of corporate planning.

(ii) Charting a decision path to the future-

Corporate plans provide a potential map of the future, highlighting decision paths with built-in flexibility.

(iii) Understanding the logical consequences of a course of
action -

Major actions have an effect on the organisation's fortune. Corporate planning tries to help the organisation think through these, not only in terms of probable profit outcomes, but also in terms of their impact on structure, resource requirement, people and future strategy.

(iv) Cordination of the complex-

Another aim of corporate planning is to improve profitability through better coordination. The corporate planning process is designed to ensure that different organisational components work together and do the agreed things at the right time. The large and complex organisation faces extremely complex coordination problems of management, resources and activity and a good planning process will go a long way to solving these.

3. Corporate Planning Model-

Corporate planning model is an important aid to corporate planning. In corporate planning model, various internal interactions and external effects can be easily incorporated and management can see their effects. Corporate models are sets of conventional logical and mathematical expressions that represent the key operations of the organisation and in virtually all cases include the items entering the normal profit and loss account and balance sheet. While these models could be operated with pencil and paper, this would be slow and tedious, and they are normally programmed for use on a computer. Much of their value lies in the speed and storage capacity of computer.

The model helps the top management to see the company as an integrated structure, which in turn helps

them to take better decisions, to evaluate alternative course of actions and hence achieve betterment of the organisation.

Broadly the corporate planning models can be employed to the following things:

(a) to determine feasible corporate goles ,

(b) to evaluate alternative courses of action,

(c) to forecast the financial position,

(d) for budgeting,

(e) for profit planning,

(f) for long term and short term planning.

CHAPTER -2
METHODOLOGIES FOR CORPORATE PLANNING MODELS

There are broadly three main methodologies used for corporate planning models:

(i) Optimization

(ii) Target Variable Approach

(iii) Simulation

2. Brief Description of Alternative Methodologies-

(i) Optimization -

The optimization approach to corporate modelling assumes that objective of the managers of the organisation is to maximise some function and that function depends upon some variables and is subject to some constraints. This methodology usually employs techniques of linear programming or integer programming.

The main draw back of this type of methodology is that it is not flexible. It assumes that function is governed by fixed set of equations. Or it assumes perfect certainty about them. In a fast changing environment risk and uncertainty is very much there. This makes the optimization approach a bit unrealistic.

(ii) Target Variable Approach-

In this some targets are assumed for some output

variables and independent variables are tried to be so adjusted as to achieve those targets. This does away with one unique maximisation value and introduces more flexibility in the hands of management. But in most of the cases targets of verious outputs are not available as targets themselves may be a function of internal interaction. This puts some limitation on this methodology.

(iii) Simulation-

The third approach to corporate planning modelling is simulation. This does not assume any a priori target or knowledge of any objective function to be maximised. In this functional relationship are established and then effects of decision variables on output variables are tested. With corporate simulation model one can generate the time paths of endogeneous variables. Thus simulation models aid the decision-taker to explore the various possibilities.

The biggest advantage of the simulation model is that it's very flexible. No rigid assumptions like fixed targets or the fexed nature of objective function are made.

The flexibility makes it most suitable to adjust itself to changing environment.

In our model we have chosen simulation modelling approach. Our model consists of a set of econometric equations.

Econometric equations help us in predicting the nature of the variables with respect to some other variables. This, in turn. helps us in simulating the system's behaviour.

CHAPTER -3

NEED FOR CORPORATE PLANNING IN STATE BANK OF INDIA

Constituted on July 1,1955 as successor to the erstwhile Imperial Bank of India in pursuance of the recommendations of the committee of Direction of the All-India Rural Credit Survey, the State Bank of India is the biggest of India's scheduled commorcial banks occupying a unique position in the country's banking system. Together with the subsidiary banks, the State Bank of India accounts for around 19% of the aggregate deposits of all scheduled commercial banks. The establishment of the bank was the direct outcome of the implementation on the part of the Government of India of the recommendations of the committee of Direction of the All India Rural Credit Survey appointed by the Reserve Bank of India in August 1951 to review the whole structure of rural credit and to make recommendations.

In recent times , the growth of its activities has been phenomenal. The management in the bank finds an onerous task to act as a development agent to translate the government policies to reality, to retain the commercial character of the bank, and to generate profit. These tasks coupled with growth has made the system of the bank complex.

In any complex system, the commonsense which is at present being employed in the bank, loses its effectiveness

CHAPTER -4

DATA COLLECTION AND ANALYSIS

The relationships in any model is based on the past data about that organisation and its environment.

Apart from the form of relationship, the feeding of realistic and relevant data is the key requirement of the model to give good results.

One of the major problems in developing an econo-metric model is that a large number of data are required. The obtaining of the required data becomes a major task. Considerable amount of time and effort was given to gather the data. In this connection we approached regional officies of State Bank of India at Varanasi and Kanpur. Authorities of SBI at these places refused to part with any information not made public. So we had to rely on only published information.

Following are the sources of data used in our study:

    (i)   Annual reports of State Bank of India

    (ii)   Reserve Bank of India Bulletions

    (iii)   Economic Survey, 1980

    (iv)   Reports on Currency and Finance

    (v)   Reports on Trends and Progress of Banking in India.

Data used for the bank are from 1976 to 1982.

Methodical ways to tackle the problem become imperative. Corporate planning can be of much use in such situations, corporate model takes care of various inter-relationships in the structure of the bank which are difficult to see by commonsense.

2. Estimation of Model Relationships-

For finding out the relevant equations for our model, variables were thought out at conceptual level and then data were used to estimate the mathematical form.

A large number of relationships were tested on computer in the quest of better form of relationships.

The forms of relationship tested were linear, log linear and parabolic. F- statistic, t- statistic and R^2 value were used to test our relationships. Logical signs were also taken into account while testing the relationship.

CHAPTER -5

ANALYSIS OF DEPOSITS AND LOANS

In any econometric model, relevant independent variables must be used to understand the behaviour of the dependent variable and to predict it correctly. The need to know the right variables increases if the dependent variable is an important variable. In a bank, the deposits and loans are two such key variables. While deposits are the main source of funds, the loans constitute the major use of fund and are the mainstay of bank's earning mechanism. Hence it becomes imperative that the behaviour of these two variables be studied in detail. A major portion of our time and effort has gone into this part of the study.

At this stage, the difference between econometric modelling for economic theory and that for corporate planning must be clearly understood . Econometric modelling for economic theory is basically to test a hypothesis. While testing a hypothesis, the significance or insignificance of variable might be important depending upon the nature of the hypothesis. But econometric modelling for corporate planning is for functional use. Insignificant variables which have little effect on forecasting abilities of model have to be discarded before using the model. The nature of the independent variables also may be different in above mentioned two

cases. In corporate planning, those variables are chosen
which are either controllable by bank management or belong
to a categroy of environmental variables for which the
corporate planner has efficient forecasting tools available.
In modelling for economic theory even those variables may
be chosen which are virtually unforecastable by bank's manage-
ments, but are relevant for theory.

Our primary aim in this analysis is to find out
the factors which logically may best affect the demand for
deposit and loan. It is well known that loan demand and depo-
sit growth tend to be related to the economy [3]. Several
macro economic variables affect a host of factors at different
level which in turn affect the banking health. Different
factors have different degree of influence on it. Besides
these macro economic factors, some banking variables will also
be important in this respect.

2. Factors Influencing the Deposits -

(i)   Demand Deposits -

In an empirical study for demand deposits (of
Indian banks) done by Kharadia [4], national income and
number of bank branches were included among other variables
like ratio of cheque clearance and bank assests to national
income.

The number of bank's branches and national income accounted for 97% of the variation in the supply of demand deposits. Other variables were found statistically insignificant. Thus the availability of banking facilities along with economic growth emerged as two dominant independent factors in influencing the supply of demand deposits.

National income has logical relationship with demand deposits. Greater the income, higher will be the savings and hence larger will be the deposits. Though it is more true for time deposits, it affects demand deposits nevertheless. This relationship has been corroborated by other researchers also [3],[7],[8],[9].

Effect of number of bank branches upon demand deposits has no logical foundation. In recent times number of branches which are being opened are primarily in rural areas and demand deposits are primarily held by businessmen who are mainly based in urpan area.

In another study for demand deposits by Kamta Prasad and Seshadri [5], the demand deposits assumed to be function of deposit rate, industrial production index, currency with public advances and wholesale price index . Data were taken from Indian Scheduled commercial and non-scheduled commercial banks and all cooperative banks.

The significant variables which emerged from
this study are

    (i)   Advances

    (ii)   Wholesale price index

It's difficult to use these results in the
corporate planning context for the following reasons:

(a) Advances may be significant because it was felt that
part of it is deposited back in the banks, and transactions
were done through cheques etc. which don't require the depo-
sits to be lowered. But this variable might not be relevant
in our case as we are considering only one bank and advances
need not be deposited back in the same bank.

(b) Wholesale price index has logical relationship with
demand deposits, because as prices go up, money value of
transaction purposes increases. But in this study
industrial production and agricultural production/were found
indexes
to be insignificant. But we think that production does have
strong bearing over the demand deposits and it may be that
wholesale price index just might be representing partly
the value of the production and this may have rendered the
production indices insignificant. We plan to include income
variable at current prices in our model to counter the value -
effect of wholesale price index. This certainly will not be

able to separate the effect of increased production and inflation, but we also don't want to increase the number of similar variables as it has untoward effect of decreasing the significance of logically relevant variables.

Though currency with public was not found to be significant in this study [5], we feel that it might be important in the case of demand deposits, as it does signify to some extent, the business activity which affects the money transation.

We feel that as an indicator of market share of the bank, the ratio of the bank's branches to total number of scheduled commercial banks' branches can be taken as a variable.

Finally, we plan to use the following variables in our study for demand deposits depending upon their significance:

(i) National income at current prices

(ii) Currency with public

(iii) Ratio of number of the bank's branches to the total number of branches of all scheduled commercial banks.

In Indian commercial banks deposits are classified as term deposits, savings deposits and current deposits. Though from 1978, some part of savings deposits is being counted as demand deposits, we include only the current account deposits in our demand deposits, as the savings component is very small.

(ii) Time Deposits—

Time deposits are different from demand deposits on two accounts. Firstly they are less liquid. Secondly, they are a financial asset, alternative to which are industrial shares, company deposits etc. They earn an interest income.

Like demand deposits, time deposits are also a function of economic growth and banking variables.

An emprical model for time deposits of banks in India was tried by Kamta Prasad and Seshadri [5]. All scheduled and unscheduled commercial banks and cooperative banks were included in the study.

Variables included in the study were deposit rate, industrial production index, agricultural production index, currency with public, wholesale price index, advances and lagged deposits.

Significant variables found were
(a)   Wholesale price index
(b)   Lagged time deposits
(c)   Advances
(d)   Industrial production index
(e)   Deposit rate

Significance of wholesale price index was explained by increased attractiveness of holding other physical assets than the time deposit. Here again, for the same reason as

given in the case of demand deposit, we plan to use income variable at current prices instead.

The reason of lagged deposit being important in the equation of time deposits of all banks is 'stickiness'. 'Stickiness' is defined as sort of inertia that if a person has been depositing his money in banks, he will continue to do so even if some other alternatives are available for depositing the money. But we are not including it in our equations because it doesn't add any additional explanatory power. Also as production indexes were not found to be important which is unrealistic, we feel that this weightage might be at the expense of indexes.

Advances, again due to reasons given in the case of demand deposit, do not seem relevant for our study.

Deposit rate was found significant in this study. Deposit rate is an indication of the income from assets of time deposits. A higher rate of interest on the deposits has been helpful in stimulating the willingness to save and thus to mobilise savings [10]. We plan to include deposit rate in our study.

As we are including income variable at current prices, there is no need of including production indices.

As time deposits which include term deposits and saving deposits are primarily held by household sector, the

availability of banking facilities will be an important factor
in mopping up household saving [10]. As an indicator of bank-
ing facility we plan to include number of bank's branches
as variable.

As an indicator of relative attractiveness, as
perceived by relative size of a bank,we are including ratio
of number State Bank of India's branches to total number of
all commercial banks' branches.

Finally we are going to use some of the following
variables in our equation for time deposit depending upon
their significance;

    (i)   National income at current prices

    (ii)   Number of SBI offices

    (iii)   Deposit rate

    (iv)   Ratio of SBI offices to total number of all
           commerical banks' offices.

3. Factors Influencing the Loans-

Loans can be expected to be a function of the
economic activity, its availability to customer and it's cost.

Income accrued to different sectors can be taken
to indicate the economic activity in those sectors.

Cost of loan is indicated by its rate of interest
State Bank of India Advance Rate which governs all the

interest rates for loans is taken to indicate rate of interest.

Availability of loans to the customer is a function of availability of banking facilities. Number of branches is taken as the indicator of banking facilities.

In Indian banks, loans apart from commercial loans, are classified as Agricultural, Small Scale Industry and small Business Financial loans.

For agricultural loans we take income acrued to agricultural sector as indicator of agricultural activity. We also expect availability of banking facilities to be very important as most of the agricultural market is underdeveloped because of non-availability of banking facilities and most of the new centres of the bank are being opened in rural areas.

For small scale industry loan we expect income accrued to manufacturing and transport sector to be dominant argument in influencing small scale industry loans.

As small scale industry is fast making dents in the underdeveloped areas, we expect the availability of banking facilities to be a dominant factor in influencing the demand for small scale industry loans.

For small business financial loans, income accrued to finance sector and transport and communication sector is taken as income variable.

In this case also availability of banking facilities is considered important as small business is fast expanding in rural region and small towns where banking facilities were hitherto neglected.

Commercial loans are usually demanded by big business firms etc; they are unlikely to be affected by increase in banking facilities major thrust of which is in rural and unbanked areas.

As big business is affected by all sectors of economy, we take national income as income variable for this.

Again, as an indicator of market share ratio of SBI branches to total branches of all commercial banks is included.

So, we include the following variables for over analysis of loans;

(i)   Income accrued to agriculture

(ii)   Income accrued to manufacturing sector

(iii) Income accrued to transport and cmmunication sector

(iv)   Income accrued to finance sector

(v)   National income

(vi)   Number of SBI offices

(vii) Ratio of SBI branches to total branches of all commercial banks.

CHAPTER -6

MODEL SPECIFICATION

1. Description of Variables -

The model consists of a set of endogenous variables, which are the dependent or output variables, and a set of exogeneous variables which are independent variables. Some of the independent variables are policy variables, i.e. over which management has some control, e.g., number of bank officies. Other independent variables like macro economic indicators, interest rates are outside the control of management. The latter types of independent variables are also important for the management as it would like to know the extent of effect of these variables and find out the extent of independence left in the decision-making. This helps in checking of taking unrealstic decisions. The effect of these type of independent variables is important from another point of view. Impact of these variables changes the environment. Changed environment demands changed policy. Hence knowing of the effect of these variables help the management in coping with the environment.

Sometimes in a model some intermediate variable may become independent policy variable. This happens when some behavioural variable (like increase in motivation etc.),

which is difficult to take into account in its individual
capacity is manifested through that intermediate variable.
For example, priority loans which are a dependent variable
in our model, can act as independent variable if the bank deci-
des to step up these loans through instructing its bank managers
to use their personal relations in this area.

```
┌─────────────────┐
│ INDEPENDENT     │
│ VARIABLE        │
│ (non-policy     │
│  variable)      │
└─────────────────┘
                    ┌──────────────┐      ┌──────────────────────┐
                    │ PLANNING     │ ───► │ DEPENDENT            │
                    │ MODEL        │      │ and                 │
                    └──────────────┘      │ OUTPUT VARIABLE     │
┌─────────────────┐        ▲             └──────────────────────┘
│ INDEPENDENT     │        │
│ VARIABLE        │   ┌─────────────────┐
│ (policy         │   │ UNEXPLAINED     │
│ variable)       │   │ VARIABLE        │
└─────────────────┘   └─────────────────┘
```
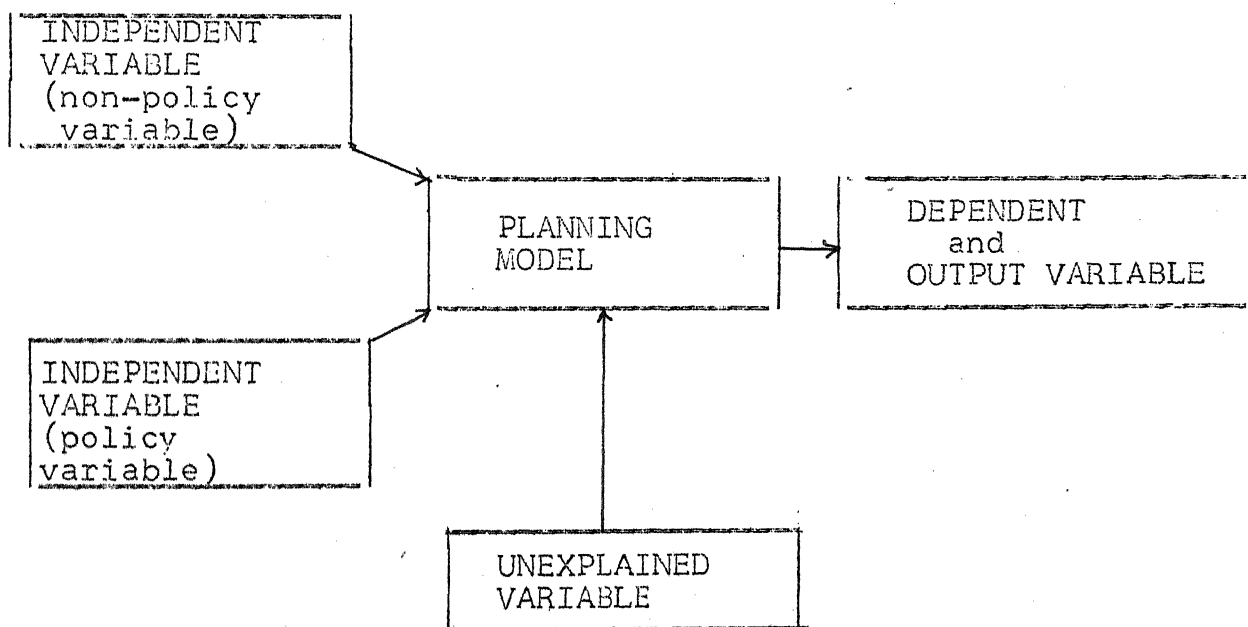
MODEL STRUCTURE

Following is the complete list of variables
used in our model. The variables names have been according to
FORTRAN language as our model has been programmed in FORTRAN
language.

EXOGENOUS VARIABLES

Variable Code	Description
NATINC	National income at current prices(in Rs. Crores)
BATINC	National income from banking, finance real estate, services etc. and transport sector at current prices (in Rs. Crores).
MNFINC	Income from manufacturing sector at current prices (in Rs. Crores).
AGINC	Income from agricultural sector (in Rs. Crores).
WPINDX	Wholesale price index (1970-71=100)
CPINDX	Consumer price index for non-manual urban worker (1960-61 =100).
CPUB	Currency with public (in Rs. Crores).
SBI	SBI Advance Rate.
IT	Time (1970-71 =1) in years.

POLICY VARIABLES

SBIOFF	Number of SBI offices.
AGLOAN	Agricultural loan (in Rs. Crores)
SBFLON	Loan for small business finance (in Rs. Crores).
SSILON	Loan for small scale industry (in Rs. Crores).

DEPENDENT VARIABLES

TERDEP	Term deposit (in Rs. Crores)
SAVING	Savings deposit (in Rs. Crores)
CURDEP	Current deposit (in Rs. Crores)
COMLON	Commercial loan (in Rs. Crores)
INTINC	Interest income (in Rs. Crores)
CONSON	Commission (in Rs. Crores)
INCHRG	Interest charges paid by SBI (in Rs. Crores).
SALEMP	Annual salary per employee (in Rs.)
NOEMP	Number of employees
TOTSAL	Total salary (in Rs. Crores)
MIROD	Mean interest rate on Deposit(in %)
MIROL	Mean interest rate on loans (in %)
EFFDEP	Effective deposit (in Rs. Crores)
TOTDEP	Total Deposits (in Rs. Crores)

EFFLON	Effective loan (in Rs. Crores)
TOTLON	Total loans (in Rs. Crores)
RENT	Rent (in Rs. Crores)
DEPCIA	Depreciation (in Rs. Crores)
OTHER	Other Expenses (in Rs. Crores)
TOEARN	Total earnings (in Rs. Crores)
TOTEXP	Total expenses (in Rs. Crores)
PRILON	Priority Loans (in Rs. Crores)
INVEST	Investment (in Rs. Crores)
BORROW	Borrowings (in Rs. Crores)
CALMON	Money at call and short notice (in Rs. Crores)

Effective deposits (EFFDEP) were calculated with 0.5 weightage of savings deposit as against 1.0 weight of term deposits for calculating interest charges as interest rate on savings deposit is nearly half of that of terms deposit.

Similarly effective loans (EFFLON) were calculated with 0.6 weightage to priority loans as against 1.0 weightage of commercial loans for calculating interest earnings. This again, is based on their approximate interest rates.

FLOW CHART

```
ECONOMIC                    ECONOMIC                  SBI
INDICATOR                   INDICATORS                OFFICES

   │                            │                        │
   ▼                            ▼                        │
 MEAN          SBI            LOANS                       │
DEPOSIT      ADVANCE                                      ▼
 RATE         RATE              │                      DEPOSITS
                               │ │ └──────┐
   │            │              │ │        │              │
   │            └────►  INTEREST│ └───► SALARY            │
   │                    INCOME  │        PER              │
   │                            │      EMPLOYEE           │
   ▼                    ┌───┐   ▼          │              │
INVESTMENT              │ 1 │  NUMBER      │         COMMISION
                        └───┘    OF        │
BORROWINGS                     EMPLOYEES   ▼              │
                                  │      TOTAL            ▼
MONEY AT                          │      SALARY        TOTAL
CALL AND                          ▼        │           INCOME
SHORT NOTICE                    RENT        │
                                  │         ▼
    1                  OTHER      │      INTEREST
                      EXPENSES    │      CHARGES
   │                     │        ▼
   ▼          SBI        │      TOTAL
 TOTAL       OFFICES     │     EXPENSES
INCOME         │         │
               ▼     DEPRECIA-
                      TION
```
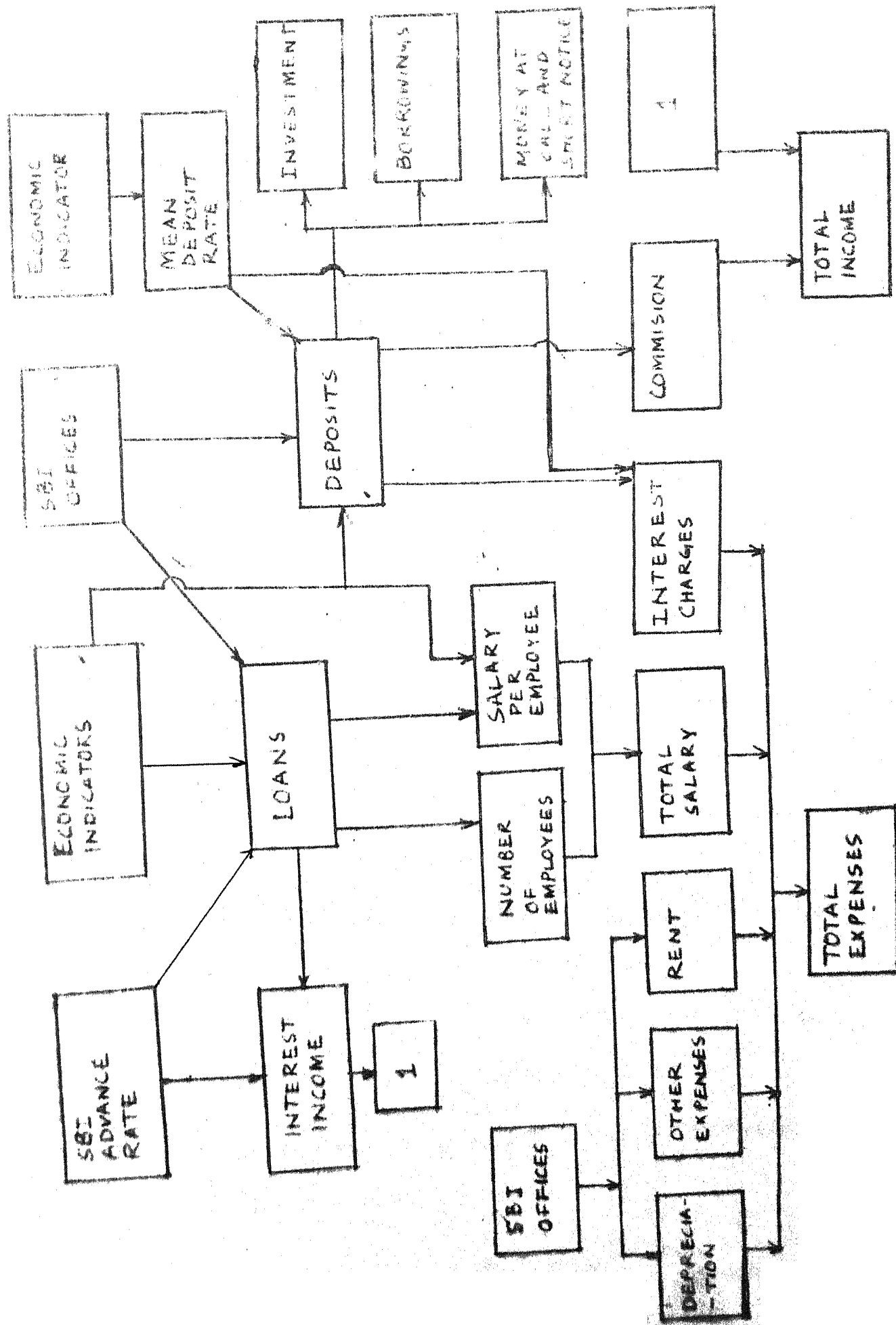
2. Model Equations Specifications —

In our econometric model for national economic indicator and SBI Advance Rate , we first fitted a trend line with time and then residues were smoothed over last five years.[*]

$$NATINC_t = 2239.0 + 8445.0 * IT_t + N_t$$

$$BATINC_t = 2053.7 + 2661.6 * IT_t + B_t$$

$$MNFINC_t = 2573.2 + 2508.9 * IT_t + MN_t$$

$$AGINC_t = 16037.0 + 2508.9 * IT_t + A_t$$

$$WPINDX_t = 90.26 + 15.45 * IT_t + W_t$$

$$CPINDX_t = 135.55 + 23.28 * IT_t + CP_t$$

$$CPUB_t = 2450.89 + 908.426 * IT_t + CPU_t$$

$$SBI_t = 6.87 + 0.8272 * IT_t + SB_t$$

N_t , B_t, MN_t, A_t, W_t, CP_t, CPU_t, SB_t are the residues and where

$$N_t = 0.385 * N_{t-5} + 0.401 * N_{t-4} + 0.0103 * N_{t-3}$$
$$+ 0.163 * N_{t-2} + 0.0388 * N_{t-1}$$

$$B_t = 0.162 * B_{t-5} + 0.0985 * B_{t-4} + 0.090 * B_{t-3}$$
$$+ 0.266 * B_{t-2} + 0.388 * B_{t-1}$$

$$MN_t = 0.219 * MN_{t-5} + 0.259 * MN_{t-4} + 0.089 * MN_{t-3}$$
$$+ 0.26 * MN_{t-2} + 0.171 * MN_{t-1}$$

[*] Data used for economic indicators' equation were from 1976 to 1982 .

$$A_t = 0.251 * A_{t-5} + 0.06 * A_{t-4} + 0.278 * A_{t-3}$$
$$+ 0.354 * A_{t-2} + 0.037 * A_{t-1}$$

$$CPU_t = 0.22 * CPU_{t-5} + 0.130 * CPU_{t-4}$$
$$+ 0.34 * CPU_{t-3} + 0.059 * CPU_{t-2} + 0.24\, CPU_{t-1}$$

$$CP_t = 0.289 * CP_{t-5} + 0.162 * CP_{t-4} + 0.239\, CP_{t-2}$$
$$+ 0.246 * CP_{t-2} + 0.063 * CP_{t-1}$$

$$SB_t = 0.0047 * SB_{t-5} + 0.0087 * SB_{t-4}$$
$$+ 0.076 * SB_{t-3} + 0.36 * SB_{t-2} + 0.54 * SB_{t-1}$$

$$MIROD_t = 1.734271 + 0.007168 * WPINDX_t$$
$$(4.9330)$$
$$DW = 1.99; R^2 = 0.89; \quad F = 24.33$$

$$MIROL_t = -8.31 + 1.628435 * SBI_t$$
$$(5.535)$$
$$DW = 1.28; \quad R^2 = 0.91; \quad F = 30.64$$

$$SBIOFF_t = 4346 + 317 * IT \quad (\text{in 1977 IT} = 1)$$
$$(20.8)$$
$$R^2 = 0.99; \quad F = 433.6$$

Deposit Equations --

$$TERDEP = -7305.44 + 1462.437 * MIROD_t^{1/2}$$
$$(16.09)$$
$$+ 0.050091 * NATINC_t + 0.558357 * SBIOFF_t$$
$$(9.511) \qquad\qquad (16.103)$$
$$DW = 2.56; \quad R^2 = 0.99; \quad F = 1103.97$$

$$SAVING_t = -3268.0 + 0.0299536 * NATINC_t$$
$$(3.161)$$
$$+ 0.519 * SBIOFF_t$$
$$(2.665)$$
$$DW = 2.56; \quad R^2 = 0.99; \quad F = 611.88$$

$$LN(CURDEP) = -7.4544 + 1.39298 * LN(NATINC_t)$$
$$(4.05)$$
$$R^2 = 0.80 \; ; \quad F = 9.995$$

$$EFFDEP_t = TERDEP_t + 0.5 * SAVING_t$$

$$TOTDEP_t = TERDEP_t + SAVING_t + CURDEP_t$$

Loan Equations –

$$LN(AGLOAN) = -31.03432 + 3.9079 * LN(SBIOFF_t)$$
$$(2.409)$$
$$+ 0.651435 * LN(AGINC) - 0.948408 * LN\cancel{c}(SBI_t)$$
$$(1.89) \qquad\qquad (1.528)$$
$$DW = 2.11; \quad R^2 = 0.95 \; ; \quad F = 59.85$$

$$LN(SSILON) = -22.085 + 3.45 * LN(SBIOFF_t)$$
$$(2.204)$$
$$- 0.623255 * LN(SBI_t) + 0.0669 * LN(MNFINC_t)$$
$$(1.30) \qquad\qquad (1.417)$$
$$DW = 2.93 \; ; \quad R^2 = 0.97 \; ; \quad F = 72.18$$

$$SBFLON = -1489.575 + 21.8443 * (SBIOFF_t)^{1/2}$$
$$(2.28)$$
$$+ 0.0054358 * BATINC_t - 1.424972 * SBI_t$$
$$(1.30) \qquad\qquad (1.39)$$
$$DW = 3.53; \quad R^2 = 0.96; \quad F = 78,18$$

$$\text{LN (COMLON)} = -10.54 + 1.726 * \text{LN} (\text{NATINC}_t)$$
$$(7.49)$$
$$-0.27 * \text{LN} (\text{SBI}_t)$$
$$(2.27)$$
$$\text{DW} = 2.05; \ R^2 = 0.96; \ \ F = 38.18$$

$$\text{PRILON}_t = \text{AGLOAN}_t + \text{SSILON}_t + \text{SBFLON}_t$$

$$\text{EFFLON}_t = \text{COMLON}_t + 0.6 * \text{PRILON}_t$$

$$\text{TOTLON}_t = \text{PRILON}_t + \text{COMLON}_t$$

Earnings Equations –

$$\text{INTINC}_t = (\text{MIROL}_t * \text{EFFLON}_t) / (100.00)$$

$$\text{COMSON}_t = -49.45 + 0.02348 * (\text{TOTDEP} (K))$$

$$\text{TOEARN}_t = \text{INTINC}_t + \text{COMSON}_t$$

Expense Equations –

$$\text{SALEMP}_t = -15402.88 + 93.29 * \text{CPI}_t$$
$$(7.82)$$
$$F = 61.28; \ \ R^2 = 0.95$$

$$\text{NOEMP}_t = 87663 + 8.1563 * \text{TOTLON}$$
$$(14.30)$$
$$\text{DW} = 1.34; \ \ F = 207.7 \ ; \ R^2 = 0.96$$

$$\text{TOTSAL}_t = (\text{SALEMP}_t * \text{NOEMP}_t)$$

$$\text{INCHRG}_t = (\text{MIROD}_t / 100.00) * \text{EFFDEP}_t$$

$$RENT_t = -138.067 + 0.031 * SBIOFF_t$$

$$(7.53)$$

$$DW = 2.07; \quad F = 56.822 \quad ; \quad R^2 = 0.96$$

$$DEPCIA_t = -5.9 + 0.00218152 * SBIOFF_t$$

$$(15.652)$$

$$DW = 2.21; \quad F = 245.81 \quad ; \quad R^2 = 0.993$$

$$OTHER_t = -74.3466 + 0.0229143 * SBIOFF_t$$

$$(2.58)$$

$$F = 6.658 \quad ; \quad DW = 2.11 \quad ; \quad R^2 = 0.76$$

$$TOTEXP_t = TOTSAL_t + INCHRG_t + RENT_t + DEPCIA_t$$
$$+ OTHER_t$$

Reserves Equation –

$$INVEST_t = 21.543 + 0.3062575 * TOTDEP_t$$

$$(15.65)$$

$$F = 245.6 \quad ; \quad R^2 = 0.98.$$

$$LN(BORROW_t) = -12.7266 + 2.14 * LN(TOTDEP_t)$$

$$(21.977)$$

$$DW = 2.88 \quad ; \quad F = 483.68 \quad ; \quad R^2 = 0.98$$

$$CALMON_t = -169.4 + 0.05667 * (TOTDEP_t)$$

$$(4.38)$$

$$DW = 2.00 \quad ; \quad F = 19.2; \quad R^2 = 0.78$$

N.B.– In brackets are t – statistic.

In most of the equations, autocorrelation was found to be absent.

CHAPTER -7

ANALYSIS OF THE RESULTANT EQUATIONS

Some of the variables which were a priori considered important but were later not found significant and hence were dropped. In savings deposit equation, deposit rate was initially included but was not found significant. We think that reason of this may be that people deposit their money in savings account for ease in transaction and security and weightage of interest rate may be minimum, as interest rates are any way comparatively quite low in saving deposit.

Number of employees were regressed against loans. This was done with a view to link number of employees to volume of work . Attempts to distribute the number of employees over different type of loans and deposits failed as all loans and deposits are highly correlated with each other. So it was not possible to regress number of employees on even two of these variables.

Salary per employee was found to be related with consumer price index for non-mannual urban workers. Here again volume of work was included in the equation as we that overtime work might contribute significantly, but was not found to be so. Salary per employee depends upon consumer price index for non-manual urban workers through the dearness

allowances as it is linked to price indices.

Mean deposit rate was regressed against wholesale price index. It was done for two reasons. First, as the prices go up people might tend to put money in higher interest deposit group to increase their income. Secondly, the government in order to mop up resources, may increase the deposit rate to increase the attractiveness of the bank deposit.

Investments by the bank are just to fulfil the legal requirement of statutory limit of reserves (which is at present 35% of the total resources). And as deposits are the main determinant of the resources, investment was linked with total deposits.

Indian commercial banks resort to borrowing when there is likely to be a shortage of required reserves to be kept with RBI against their liabilities. Deposits are the major part of liabilities. So borrowings were regressed against total deposits.

Money at call and short notice was regressed with total deposit as this is a part of the liquid reserves. And reserves are related to total resources through legal requirement.

Mean loan rate was linked to State Bank of India (SBI) Advance rate as all the loan rates are governed by

SBI advance rate.

Commissions earned on services like cheques, draft, etc. can logically be related to deposits as drafts etc. are drawn on deposited amount. And higher the deposit higher will be the expected number of cheques, drafts etc.

All the equations used are statistically signifi-cant at 1% level. Most of the variables used in the equation are significant at 5% level. Signs of the variables are as expected.

CHAPTER -8

EXPERIMENTS WITH THE MODEL

The simulation type of model gives us the out-come of various strategies. Based upon the outcome, the management formulates its policy.

Here, we have developed some scenarios for different strategies and environment.

2. Table of Generated Scenarios

Scenario	Description
1.	Present policies continued.
2.	Increase in SBI offices frozen .
3.	Number of SBI offices increases by 2% annually.
4.	SBI Advance Rate increases by 1% after every 2 years.
5.	SBI Advance Rate increases by 2% after every 2 years.
6.	(i) National income variable increase by 10% annually. (ii) SBI offices increase by 5% annually.

7.   (i) National income variables increase by 10% every year.
      (ii) SBI Advance Rate increases by 2% after every 2 years.

8.   (i) National income variables increase by 4% annually .
      (ii) SBI Advance Rate increases by 2% after every two years.
      (iii) SBI offices increase by 5% annually.

9.   (i) SBI Advance Rate increases by 3% after every 2 years.
      (ii) SBI offices increase by 6% annually.

10.   (i) National income variables increase by 4% every year .
      (ii) SBI Advance Rate increases by 3% after every two years.
      (iii) SBI offices increase by 6% annually

11.   (i) SBI Advance Rate increase by 1% after every two years.
      (ii) SBI offices increase by 6% every year.

12.   (i) National income variables increase by 10% every year.
      (ii) SBI offices increase by 5.5% annually.

3. <u>Some Derivations From The Outcomes of Strategies</u> -

    (a) Effect of number of SBI offices-

           In scenario 2 and 3, SBI offices were
increased by 0% and 2% respectively. In scenario 1, SBI
offices growth rate is around 4%. Agricultural loans and
loans for Small Scale Industry increased tremendously with
the increase in SBI offices. But this increase in loans was
not matched by increase in deposits. In fact, when SBI offices
growth rate was increased beyond 6% , the demand of loans
was much beyond the total availablity of funds. This shows
that the loans are stronger function of availibility of ban-
king facilites than deposits. It may be added further that
loans need is not being satisfied in rural areas (new
branches of the bank are mainly being opened in rural
areas) to the extent the bank could have, due to lack
of funds.

           In scenario 2. when increase in new
branches was frozen, the demand for agricultural loan and
SSI loan decreased while for SBF loan, increase in demand
was very small . This means that income effect was more
than offset by the rate of interest (cost of loan). It
also shows that increase in priority loans mainly due to
tapping of new customers. It is also to be noticed that
term deposit was not affected much by freezing the increase,

but savings deposit was substantially affected.

In scenarios 6 to 12, SBI offices were increased by 5 to 6% respectively with different national income growth rates. Present growth rate is about 7% (at current prices). The growth rates of 10% and 4% were chosen for improved and depressed economy respectively. It was found that in depressed economy sustainable growth rate for SBI offices is around 5% while for vigorous economy, sustainable growth rate was around 6%. Greater growth, rate of SBI offices than the above menti.- oned ones will increase the demand for loans beyond the avai- lability of funds provided by deposits.

(b) Effect of SBI Advance Rate

In scenarios 4 and 5, SBI advance rate was increased by 1% and 2% respectively after every two years. In scenario 5, the bank incurred losses while in scenario 9, increase in earning was almost matched by the expenses. This gives some idea about sustainable rate for the bank. The SBI Advance Rate should be increased by more than 2% after every 2 years for the bank not be in red.

Effect of advance rate on the priority loans was pronounced. Agricultural and SSI loans were particularly greatly affected by advance rate. Commercial loans were not much affected by the changes in advance rate.

4. Conclusions –

The bank's aim is to retain its commercial status and also to work as a development agent. As a development agent the bank has to disburse the priority loans. So the bank has to choose that policy which without harming its commercial viability, maximises the priority loans.

In scenario 7 to 11, we have tried to see the simultaneous effect of SBI Advance Rate and SBI offices. In vigorous economy (income increases by 10%) high SBI advance rate is sustainable. This is possible because in better economy cost of loans is offset by higher income. In improved economy, higher growth rate of SBI offices(of around 6%) is sustainable, as the bank has larger funds to meet with the demand of loans.

So improved economy SBI advanced rate can increase by 3% after every two years. Also SBI offices should be increased by 6% annnualy.

In depressed economy (income growth rate of 4%) high SBI offices increase (around 6%) is not sustainable. This results in less loans and hence less earnings. But to increase earnings, SBI advance rate canot be increased much because it will have negative effect on priority loans. Final effect is that SBI advance rate increase which is sustainable is around 2% after every two years. SBI offices increase rate which is sustainable is around 5% annually.

CHAPTER -9

FURTHER SCOPE IN THE MODEL

Present model suffers from some limitations mainly due to non-availability of data.

First, India being a vast country no uniform model can be used for the whole country. In India, banking habits and economy differ drastically from region to region. It would be better if model is divided into sub-models on regional basis, and/these sub-models are integrated to give the final picture.

We were unable to take regional bias into account as State Bank of India does not publish any information on regional activities for public and the bank's authorities refused to lend any information which was not public.

We have forecasted national economic indicators with time. While considering regional economy it will be more useful if a more comprehensive forecasting model which includes metereological, industrial and political climate, is used.

Cost function can be improved if a detailed study of the bank's branches' functioning is done. This will help in determining the cost of different banking activities at a micro-level. This again must be done on a regional basis as we strongly feel that cost function differs substantially from region to region.

We hope that further work on this will take these things into account.

STATE BANK OF INDIA

(Amount in Rs. Crores)

At the end of the year	1965	1970	1975	1976	1977	1978	1979	1980
Deposits	735	1441	3598	4632	4632	7015	9598	9636
Loans	451	1115	2501	3259	3751	4848	5726	7213
Agricultural Loans	-	122	241	390	486	695	922	1110
SBP Loans	-	24	52	84	122	163	235	304
SBI Loans	25	152	320	376	462	591	733	953
Investments	264	448	1100	1432	1734	2138	2529 / 2581	2588 / 2024
Number of Employees	37936	67221	104493	108493	117026	131961	131960	150450

DATA SHEET

(Source:

SBI Annual Report 1980)

REFERENCES

1. S.R. Subba Rao ' Corporate Planning Model for Bank'.
    'Productivity', July Sept, 1980. Vol XXI, No.2.

2. Thomas Naylor ' Simulation Models in Corporate Planning'.

3. Cohran A. John ' Money, Banking and the Economy'
    1967, Macmillan. N.Y.

4. V.C. Kharadia, ' The behaviour of the currency, Demand
    Deposit Ratio in India, Its Effect on
    Money Supply and Implementation for
    Monetary Policy.'
    ' Indian Economic Journal' Vol.31,
    July - Sep., 1983 pp.51.

5. Kamta Prasad, Seshadri ' A behavioural Analysis of
    Bank Deposits in India'
    'Indian Economic Journal' Vol. 28, July-
    Sep., 1980, pp.32.

6. SBI Monthly Bulletin, April 1983.

7. Richard Tower 'Money Creation and theory of Banking firm'
    'Journal of Finance March-May 1974, Vol.29
    Part 1, pp.57.

8. R. Raghupati, 'Challenges Ahead of Indian Banking'
    'Commerce' July 30, 1983.

9. TCA- Srinivasa - Raghvan ' Indian Banking Today'

    ' Eastern Economist' Nov. 20,1981.

10. Sharma S.P. ' The Role of Commercial Banks in India's

    Developing Economy'

    1974, S. Chand Company, Delhi.

11. D.E. Hussy, ' Introducing Corporate Planning'

    ' Peragamon Press, 1979 Oxford.

12. M.L. Tandon, ' Banking Law and Practice in India'

    4th Ed. 1973. Thacker and Co., Ltd.

    Bombay.

13. 'The Commercial Banking Industry ' The American Bankers

    Association.

    1964, Prentice Hall Inc. N.J.

14. Donald D. Hester, ' Indian Banks, Their Portfolios,

    Profits, and Policy '

    1963, University of Bombay.

15. David Hussey ' The Truth about Corporate Planning'

    Paragamon Press, Oxford.

16. Hester and Tobin, ' Studies of Portfolio Behaviour'

    John Wiley and Sons, Inc. N.Y.

17. M.J.C. Surrey, ' An Introduction to Econometrics'

    Clarendon Press, Oxford, 1974.

18. Joel Dean,'Managerial Economics' : .

    1968, Prentice Hall of India.